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STAAS & HALSEY LLP
SUITE 700
1201 NEW YORK AVENUE, N.W.
WASHINGTON, DC 20005

EXAMINER	
JEN, MINGJEN	

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3664	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/823,548	LEE ET AL.	
	Examiner	Art Unit	
	Ian Jen	3609	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *23 October 2007*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-17 and 20-26* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-17 and 20-26* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *14 April 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

KHOI H. TRAN
SUPERVISORY PATENT EXAMINER

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *03/07/2005;04/30/2004*.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

1. Applicant's election without traverse of Species I in the reply filed on 10/23/2007 is acknowledged.

Foreign Priority

2. Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

Response to Amendment

3. This action is in response to the communication filed on October 23, 2007

4. Claims 1-17, 20-26 are pending in this action.

5. Claims 18,19 have been withdrawn responding to the election.

6. Claims 27-40 have been cancelled responding to the election.

Double Patenting

7. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined

application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

8. Claims 1-17, 20-26 are provisionally rejected on the ground of nonstatutory double patenting over claim 1-37 of copending Application, Lee et al (US Pat Pub 2004/0204804) in view of Lee et al (US Pat Pub 2004/0158354). Although the conflicting claims are not identical, they are patentably distinct from each other because claim 1 of the present application is an obvious variation of claims 1-37 of copending Application, Lee et al (US Pat Pub 2004/0204804) in view of Lee et al (US Pat Pub 2004/0158354).

This is a provisional obviousness type double patenting rejction because the conflicting claims have not in fact been patented.

The conclusion of obviousness type double patenting is made in light of these factual determinataions:

Claims 1-37 of copending Application, Lee et al (US Pat Pub 2004/0204804) shows

- method of allowing a mobile robot to return to a designated location, wherein the designated location has a sound wave transmitter
- mobile robot has a sound wave receptor and the mobile robot automatically returns from a first location to the designated location
- distance measured based on a difference between the time when a predetermined time synchronization signal.
- Generating an angular velocity command so that a direction that the robot travel is shifted based on result of the comparison carried out in the comparsions of the distance between the docking station and robot.
- Trajectory calculation equation in linear velocity and angular velocity command
- Distance calculator
- Travel controller
- Synchronization signal controller
- First, second timer
- Ultrasonic wave
- Infrared signal, radio frequency signal
- All directional wave sensor
- Computer readable medium

Claims 1- 14 of copending Applications, Lee et al (US Pat Pub 2004/0158354) shows

- the method comprising: calculating a first direction angle of the mobile robot at a second location arrived at after the mobile robot travels a first distance from the first location;
- determining whether the mobile robot approaches or moves away from the designated location, at a third location arrived at after the mobile robot rotates by the first direction angle and then travels a second distance;
- if the result of the determination indicates that the mobile robot approaches the designated location, controlling the mobile robot to travel according to the first direction angle,
- if the result indicates the mobile robot moves away from the designated location, calculating a second direction angle of the mobile robot at the third location,
- controlling the mobile robot to travel according to the second direction angle.
- First/second transmitting unit
- First/second receiving unit
- Distance calculating unit
- Incident angle calculation unit
- Supersonic wave
- Docking unit, robot unit
- Measure positional change between previous and current position and directional change between current and previous orientation
- State observer, kalmal filter

- Radio wave, absoulte azimuth measurement unit

It would have been obvious for one of ordinary skill in ther art to provide the autonomous robot directional angle measurement appartus as demonstarted by Lee et al (US Pat Pub 2004/0158354), to the travel method of Lee et al (US Pat Pub 2004/0204804), in order to provide sufficient mechanism for performing autonomous robot travel functionality.

Claim Rejections - 35 USC § 103

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

10. Claim 1 is rejected under 35 U.S.C. 103(a) as being unpatentable over George,II et al (US Pat No 4777416) in view of Kim (US Pat 630814).

As for claim 1, George II,et al shows a method of allowing a mobile robot to return to a designated location (abstract; Col 1, lines 50 - 70); the mobile robot has a sound wave receptor (Fig 3, Fig 5; Col 3,lines 60 - Col 4,lines 25; Col5,lines 45 - 5); the mobile robot automatically returns from a first location to the designated location (abstract, Fig 5; Col 1,lines 45 - 65); calculating a first direction angle of the mobile robot at a second location arrived at after the mobile robot travels a first distance from the first location (Fig 5, Col 6,lines 35 - Col 7,lines 25; Fgi 10; Fig 11; Fig 13, Col 11, lines 60- Col 12,lines 20; Col 9,ines 30 - Col 10,lines 2);

determining whether the mobile robot approaches or moves away from the designated location (Fig 5, Fig 7, Fig 13, Col 6,lines 30 - Col 7,lines 15; Col 11,lines 60 - Col 12,lines 65; Col 13,lines 60 - Col 14, lines 55), at a third location arrived at after the mobile robot rotates by the first direction angle and then travels a second distance (Fig 5, Fig 7, Fig 9, Fig 10, Fig 13; Col 6,lines 30 - Col 7,lines 15; Col 9,lines 10- Col 11, lines 5; Col 11,lines 60 - Col 12,lines 65); if the result of the determination indicates that the mobile robot approaches the designated location, controlling the mobile robot to travel according to the first direction angle (Fig 5, Fig 7, Fig 9, Fig 10, Fig 13; Col 6, lines 30 - Col 7, lines 15; Col 9,lines 10- Col 11, lines 5; Col 11,lines 60 - Col 12,lines 65), and if the result indicates the mobile robot moves away from the designated location, calculating a second direction angle of the mobile robot at the third location, and controlling the mobile robot to travel according to the second direction angle (Fig 5, Fig 7, Fig 9, Fig 10, Fig 13; Col 6, lines 30 - Col 7, lines 15; Col 9,lines 10- Col 11, lines 5; Col 11,lines 60 - Col 12,lines 65). George II,et al does not show a sound wave transmitter. Kim shows the designated location has a sound wave transmitter (Abstarct, Fig 1;Col 3, lines 20- 60)

It would have been obvious for one of ordinary skill in the art to provide the ultrasonic signal transmitter, as taught by Kim, to George II et al, since the navigation apparatus equipped on the George II et al can be easily manipulated using the method provided by Kim using the ultrasonice songal of George II et al.

As for claim 2, George, II et al shows the first and second direction angles are calculated by using a distance between the mobile robot (Fig 5, Fig 7, Fig 9, Fig 10, Fig 13; Col 6, lines 30 - Col 7, lines 15; Col 9,lines 10- Col 11, lines 5; Col 11,lines 60 - Col 12,lines 65), a travel distance provided by an encoder connected to a motor of the mobile robot (Col 4, lines 50 - Col

5,lines 15). George, II et al shows the designated location calculated from a time difference between a time (Col 18, lines 20-60; Fig 31,Fig 32).

George, II et al does not show sound wave transmitter transmits a sound wave.

Kim shows the designated location calculated from a time difference between a time when the sound wave transmitter transmits a sound wave (Fig 1, Col 10, lines 35 -65; Fig 4, Col 4,lines 20- Col 5,lines 13) and a time when the sound wave receptor receives the sound wave (Fig 1, Col 10, lines 35 -65; Fig 4, Col 4,lines 20- Col 5,lines 13).

It would have been obvious for one of ordinary skill in the art to provide the distance calculating method as taught by Kim, to George, II et al, since the navigational appartatus equpped on George, II et al can be easily manipulated using the sound wave receptor of Kim.

As for claim 3, George, II et al shows calculate distance and turning angle in multiple locations; at the first location, calculating a first distance between the mobile robot and the designated location (Fig 5, Col 6,lines 35 - Col 7,lines 25; Fgi 10; Fig 11; Fig 13, Col 11, lines 60- Col 12,lines 20; Col 9,ines 30, equation 1; Col 10,lines 2, equation 2); after traveling the mobile robot to the second location from the first location, calculating at the second location a second distance between the mobile robot and the docking station (Fig 5, Fig 7, Fig 9, Fig 10; Col 6,lines 30 - Col 7,lines 15; Col 9,lines 10- Col 11, lines 5) ; and calculating the first direction angle by using the first distance, the second distance and a travel distance between the first location and the second location (Fig 5, Fig 9, Fig 10, Fig 13; Col 6, lines 30 - Col 7, lines 15; Col 9,lines 10- Col 11, lines 5; Col 11,lines 60 - Col 12,lines 65).

As for claim 4, George, II et al shows calculate distance and turing angle at various locations; rotating the mobile robot by the first direction angle in an arbitrary direction (Fig 5, Fig 7, Fig 9, Fig 10, Fig 13; Col 6, lines 30 - Col 7, lines 15; Col 9,lines 10- Col 11, lines 5; Col 11,lines 60 - Col 12,lines 65; Fig 4, Col 5,lines 55 - Col 6,lines 30) and traveling the mobile robot to a third location (Fig 5, Fig 7, Fig 9, Fig 10, Fig 13; Col 6, lines 30 - Col 7, lines 15; Col 9,lines 10- Col 11, lines 5; Col 11,lines 60 - Col 12,lines 65; Fig 4, Col 5,lines 55 - Col 6,lines 30); at the third location, calculating a third distance between the mobile robot and the designated location (Fig 5, Col 6,lines 35 - Col 7,lines 25; Fgi 10; Fig 11; Fig 13, Col 11, lines 60- Col 12,lines 20; Col 9,ines 30, equation 1; Col 10,lines 2, equation 2); estimating the distance to the designated location from the third location (Fig 5, Fig 7, Fig 9, Fig 10, Fig 13; Col 6, lines 30 - Col 7, lines 15; Col 9,lines 10- Col 11, lines 5; Col 11,lines 60 - Col 12,lines 65; Fig 4, Col 5,lines 55 - Col 6,lines 30) after the mobile robot rotates by the first direction angle in the direction of increasing distance from the designated location (Fig 5, Fig 7, Fig 9, Fig 10, Fig 13; Col 6, lines 30 - Col 7, lines 15; Col 9,lines 10- Col 11, lines 5; Col 11,lines 60 - Col 12,lines 65; Fig 4, Col 5,lines 55 - Col 6,lines 30); and travels a predetermined distance between the second location and the third location (Fig 5, Fig 7, Fig 9, Fig 10, Fig 13; Col 6, lines 30 - Col 7, lines 15; Col 9,lines 10- Col 11, lines 5; Col 11,lines 60 - Col 12,lines 65; Fig 4, Col 5,lines 55 - Col 6,lines 30); and comparing the calculated third distance with the estimated distance (Fig 5, Fig 7, Fig 9, Fig 10, Fig 13; Col 6, lines 30 - Col 7, lines 15; Col 9,lines 60- Col 11, lines 60; Col 11,lines 60 - Col 12,lines 65; Fig 4, Col 5,lines 55 - Col 6,lines 30).

As for claim 5, George, II et al shows calculate distance and turing angle in multiple locations; calculating a second direction angle of the mobile robot by using the second distance (

Fig 5, Col 6, lines 30 - Col 7,lines 5), the third distance and the travel distance between the second location and the third location (Fig 5, Fig 7; Col 7,lines 50 - Col 8,lines 50); if the result of the comparison indicates that the third distance is different from the estimated distance (Col 9,lines 25 - Col 11,lines 15), controlling the mobile robot to travel according to the first direction angle (Fig 5, Fig 7, Fig 9, Fig 10, Fig 13; Col 6, lines 30 - Col 7, lines 15; Col 9,lines 10- Col 11, lines 5; Col 11,lines 60 - Col 12,lines 65; Fig 4, Col 5,lines 55 - Col 6,lines 30); and if the result of the comparison indicates that the third distance is the same as the estimated distance angle (Fig 5, Fig 7, Fig 9, Fig 10, Fig 13; Col 6, lines 30 - Col 7, lines 15; Col 9,lines 10- Col 11, lines 5; Col 11,lines 60 - Col 12,lines 65; Fig 4, Col 5,lines 55 - Col 6,lines 30), controlling the mobile robot to travel according to the second direction angle angle (Fig 5, Fig 7, Fig 9, Fig 10, Fig 13; Col 6, lines 30 - Col 7, lines 15; Col 9,lines 10- Col 11, lines 5; Col 11,lines 60 - Col 12,lines 65; Fig 4, Col 5,lines 55 - Col 6,lines 30).

As for claim 6, George, II et al shows calculate distance and turning angle in multiple locations; if the first direction angle is an acute angle (Fig 5, Fig 7, Fig 9, Fig 10, Fig 13; Col 6, lines 30 - Col 7, lines 15; Col 9,lines 10- Col 11, lines 5; Col 11,lines 60 - Col 12,lines 65; Fig 4, Col 5,lines 55 - Col 6,lines 30), the rotation direction of the second direction angle is controlled to be opposite to the rotation direction of the first direction angle (Fig 5, Fig 7, Fig 9, Fig 10, Fig 13; Col 6, lines 30 - Col 7, lines 15; Col 9,lines 10- Col 11, lines 5; Col 11,lines 60 - Col 12,lines 65; Fig 4, Col 5,lines 55 - Col 6,lines 30); and if the first direction angle is an obtuse angle, the rotation direction of the second direction angle is controlled to be the same as the rotation direction of the first direction angle (Fig 5, Fig 7, Fig 9, Fig 10, Fig 13; Col 6, lines 30 -

Col 7, lines 15; Col 9,lines 10- Col 11, lines 5; Col 11,lines 60 - Col 12,lines 65; Fig 4, Col 5,lines 55 - Col 6,lines 30).

As for claim 7, George, II et al does not shows the time difference between the time of transmitting the sound wave from the designated location incident on the mobile robot, and the time of receiving the sound wave is calculated based on the transmission and reception time points of a predetermined time synchronization signal from the designated location incident on the mobile robot.

Kim shows the time difference between the time of transmitting the sound wave from the designated location incident on the mobile robot (Fig 1, Fig 3; Col 3,lines 45 - Col 5,lines 20), and the time of receiving the sound wave is calculated based on the transmission and reception time points of a predetermined time synchronization signal from the designated location incident on the mobile robot (Fig 1, Fig 3; Col 3,lines 45 - Col 5,lines 20).

It would have been obvious for one of ordinary skill in the art to provide the distance calculating method as taught by Kim, to George, II et al, since the navigational appartatus equipped on George, II et al can be easily manipulated using the sound wave receptor of Kim.

As for claim 8, George, II et al show a speed of transmission of the time synchronization signal is faster than a speed of transmission of the sound wave (Col 18, lines 20- Col 19, lines 20; Col 5,lines 35 - Col 6,lines 20; Fig 31, Fig 32).

As for claim 9, George, II et al shows the time synchronization signal is one of an infrared (IR) signal or a radio frequency (RF) signal, and the sound wave is an ultrasonic wave (Col 18, lines 20 - 65).

As for claim 10,George, II et al shows the the time difference between the transmission time and the reception time of incident on the mobile robot is calculated based on a predetermined timing signal (Col 18, lines 20 - 65).

As for claim 12, George, II et al shows a program enabling the method is recorded on a computer-readable recording medium (Fig 3; Col 5,lines 35 - Col 6,lines 30).

As for claim 13, George II,et al shows an apparatus for allowing a mobile robot to automatically return to a designated location from a first location (abstract; Col 1, lines 50 - 70), the apparatus comprising: a sound wave receptor installed in the mobile robot receiving the sound wave (Fig 3, Fig 5; Col 3,lines 60 - Col 4,lines 25; Col5,lines 45 - 5); a distance calculator which calculates a distance between the designated location and the mobile robot (Fig 5, Fig 7, Fig 9, Fig 10, Fig 13; Col 6,lines 30 - Col 7,lines 15; Col 9,lines 10- Col 11, lines 5; Col 11,lines 60 - Col 12,lines 65), an encoder connected to at least one or more motors and measuring a travel distance and a travel direction of the mobile robot (Col 4, lines 50 - Col 5,lines 15; Fig 5, Fig 7, Fig 9, Fig 10, Fig 13; Col 6, lines 30 - Col 7, lines 15; Col 9,lines 10- Col 11, lines 5; Col 11,lines 60 - Col 12,lines 65); and a travel controller which by using the distance calculated in the distance calculator and the travel distance measured by the encoder (Col 4, lines 50 - Col 5,lines 15; Fig 5, Fig 7, Fig 9, Fig 10, Fig 13; Col 6, lines 30 - Col 7, lines 45; Col 9,lines 10-

Col 11, lines 5; Col 11,lines 60 - Col 12,lines 65), calculates a first direction angle at a second location arrived at after the mobile robot travels a first distance between the first location and the second location (Col 4, lines 50 - Col 5,lines 15; Fig 5, Fig 7, Fig 9, Fig 10, Fig 13; Col 6, lines 30 - Col 7, lines 45; Col 9,lines 10- Col 11, lines 5; Col 11,lines 60 - Col 12,lines 65), determines whether the mobile robot approaches or moves away from the designated location (Fig 5, Fig 7, Fig 13, Col 6,lines 30 - Col 7,lines 15; Col 11,lines 60 - Col 12,lines 65; Col 13,lines 60 - Col 14,lines 55), at a third location arrived at after the mobile robot is rotated by a first direction angle and travels a second distance between the second location and the third location (Col 4, lines 50 - Col 5,lines 15; Fig 5, Fig 7, Fig 9, Fig 10, Fig 13; Col 6, lines 30 - Col 7, lines 45; Col 9,lines 10- Col 11, lines 5; Col 11,lines 60 - Col 12,lines 65), and controls the mobile robot to travel according to the result of the determination (Col 4, lines 50 - Col 5,lines 15; Fig 5, Fig 7, Fig 9, Fig 10, Fig 13; Col 6, lines 30 - Col 7, lines 45; Col 9,lines 10- Col 11, lines 5; Col 11,lines 60 - Col 12,lines 65).

Kim shows a sound wave transmitter installed on the designated location transmitting a sound wave (Abstract, Fig 1;Col 3, lines 20- 60); using a time difference between times of transmission and reception of the sound wave transmitted by the sound wave transmitter to the sound wave receptor (Fig 1, Col 10, lines 35 -65; Fig 4, Col 4,lines 20- Col 5,lines 13).

It would have been obvious for one of ordinary skill in the art to provide the distance calculating method as taught by Kim, to George, II et al, since the navigational appartatus equipped on George, II et al can be easily manipulated using the sound wave receptor of Kim.

As for claim 14, George, II et al does not show a time synchronization signal transmitter in the designated location and generating and transmitting a time synchronization signal; and a

time synchronization signal receptor included in the mobile robot and receiving the time synchronization signal.

Kim shows a time synchronization signal transmitter in the designated location (Fig 1, Fig 3; Col 3, lines 45 - Col 5,lines 20) and generating and transmitting a time synchronization signal (Fig 1, Fig 3; Col 3, lines 45 - Col 5,lines 20); and a time synchronization signal receptor included in the mobile robot and receiving the time synchronization signal (Fig 1, Fig 3; Col 3, lines 45 - Col 5,lines 20).

It would have been obvious for one of ordinary skill in the art to provide the distance calculating method as taught by Kim, to George, II et al, since the navigational apparatus equipped on George, II et al can be easily manipulated using the time synchronization signal of Kim.

As for claim 15, George, II et al shows a speed of transmission of the time synchronization signal is faster than a speed of transmission of the sound wave (Col 18, lines 20- Col 19, lines 20; Col 5,lines 35 - Col 6,lines 20; Fig 31, Fig 32).

As for claim 16, George, II et al shows the time synchronization signal is one of an infrared (IR) signal or a radio frequency (RF) signal, and the sound wave is an ultrasonic wave (Col 18, lines 20- Col 19, lines 20; Col 5,lines 35 - Col 6,lines 20; Fig 31, Fig 32).

As for claim 17, George, II et al shows the distance between the designated location and the mobile robot is calculated based on a gap between a time when the time synchronization signal receptor receives the time synchronization signal and a time when the sound wave

receptor receives the sound wave (Fig 5, Fig 7, Fig 9, Fig 10, Fig 13; Col 6,lines 30 - Col 7, lines 15; Col 9, lines 10- Col 11, lines 5; Col 11, lines 60 - Col 12, lines 65; Col 18, lines 20- Col 19, lines 20; Col 5,lines 35 - Col 6,lines 20; Fig 31, Fig 32).

As for claim 21, George, II et al shows if the mobile robot approaches the designated location (Fig 5, Fig 7, Fig 9, Fig 10, Fig 13; Col 6, lines 30 - Col 7, lines 15; Col 9, lines 10- Col 11, lines 5; Col 11, lines 60 - Col 12, lines 65; Fig 4, Col 5,lines 55 - Col 6,lines 30; abstract; Col 1, lines 50 - 70), the travel controller controls the mobile robot to travel according to the first direction angle (Col 4, lines 50 - Col 5,lines 15; Fig 5, Fig 7, Fig 9, Fig 10, Fig 13; Col 6, lines 30 - Col 7, lines 45; Col 9, lines 10- Col 11, lines 5; Col 11, lines 60 - Col 12, lines 65) and if the mobile robot moves away from the designated location (Fig 5, Fig 7, Fig 9, Fig 10, Fig 13; Col 6, lines 30 - Col 7, lines 15; Col 9, lines 10- Col 11, lines 5; Col 11, lines 60 - Col 12, lines 65), the travel controller calculates a second direction angle of the mobile robot at the third location and controls the mobile robot to travel according to the second direction angle (Fig 5, Fig 7, Fig 9, Fig 10, Fig 13; Col 6, lines 30 - Col 7, lines 15; Col 9, lines 10- Col 11, lines 5; Col 11, lines 60 - Col 12, lines 65).

As for claim 22, George, II et al shows the travel controller calculates the first direction angle by using the first distance between the mobile robot at the first location and the designated location (Col 4, lines 50 - Col 5,lines 15; Fig 5, Fig 7, Fig 9, Fig 10, Fig 13; Col 6, lines 30 - Col 7, lines 45; Col 9, lines 10- Col 11, lines 5; Col 11, lines 60 - Col 12, lines 65), the second distance between the mobile robot at the second location (Fig 5, Fig 7, Fig 9, Fig 10, Fig 13; Col 6, lines 30 - Col 7, lines 15; Col 9, lines 10- Col 11, lines 5; Col 11, lines 60 - Col 12, lines 65;

Fig 4, Col 5,lines 55 - Col 6,lines 30; abstract; Col 1, lines 50 - 70) , and the designated location, and the travel distance between the first location and the second location (Fig 5, Fig 7, Fig 9, Fig 10, Fig 13; Col 6, lines 30 - Col 7, lines 15; Col 9, lines 10- Col 11, lines 5; Col 11, lines 60 - Col 12, lines 65; Fig 4, Col 5,lines 55 - Col 6,lines 30; abstract; Col 1, lines 50 - 70).

As for claim 23, George, II et al shows the travel controller calculates the second direction angle by using the second distance location (Fig 5, Fig 7, Fig 9, Fig 10, Fig 13; Col 6, lines 30 - Col 7, lines 15; Col 9, lines 10- Col 11, lines 5; Col 11, lines 60 - Col 12, lines 65; Fig 4, Col 5,lines 55 - Col 6,lines 30; abstract; Col 1, lines 50 - 70), a third distance between the mobile robot at the third location (Fig 5, Fig 7, Fig 9, Fig 10, Fig 13; Col 6, lines 30 - Col 7, lines 15; Col 9, lines 10- Col 11, lines 5; Col 11, lines 60 - Col 12, lines 65; Fig 4, Col 5,lines 55 - Col 6,lines 30; abstract; Col 1, lines 50 - 70), arrived at after the mobile robot rotates by the first direction angle in an arbitrary direction at the second location and travels a predetermined distance, and the travel distance between the second location and the third location (Fig 5, Fig 7, Fig 9, Fig 10, Fig 13; Col 6, lines 30 - Col 7, lines 15; Col 9, lines 10- Col 11, lines 5; Col 11, lines 60 - Col 12, lines 65; Fig 4, Col 5,lines 55 - Col 6,lines 30; abstract; Col 1, lines 50 - 70).

As for claim 24, George, II et al shows if at the second location the mobile robot rotates in the direction of increasing distance from the docking station (Fig 5, Fig 7, Fig 13, Col 6,lines 30 - Col 7, lines 15; Col 11, lines 60 - Col 12, lines 65; Col 13, lines 60 - Col 14, lines 55), the travel controller estimates the distance between the mobile robot at the third location and the designated location (Fig 5, Fig 7, Fig 13, Col 6,lines 30 - Col 7, lines 15; Col 11, lines 60 - Col 12, lines 65; Col 13, lines 60 - Col 14, lines 55), and if the third distance is different from the estimated distance (Fig 5, Fig 7, Fig 9, Fig 10, Fig 13; Col 6,lines 30 - Col 7, lines 15; Col 9,

lines 10- Col 11, lines 5; Col 11, lines 60 - Col 12, lines 65), controls the mobile robot to travel according to the first direction angle (Fig 5, Fig 7, Fig 9, Fig 10, Fig 13; Col 6,lines 30 - Col 7, lines 15; Col 9, lines 10- Col 11, lines 5; Col 11, lines 60 - Col 12,lines 65), and if the third distance is the same as the estimated distance, controls the mobile robot to travel according to the second direction angle (Fig 5, Fig 7, Fig 9, Fig 10, Fig 13; Col 6,lines 30 - Col 7,lines 15; Col 9,lines 10- Col 11, lines 5; Col 11,lines 60 - Col 12,lines 65).

As for claim 25, George, II et al shows the travel controller determines the rotation direction of the second direction angle according to whether the first direction angle is an acute angle or an obtuse angle (Fig 5, Fig 7, Fig 9, Fig 10, Fig 13; Col 6,lines 30 - Col 7,lines 15; Col 9,lines 10- Col 11, lines 5; Col 11,lines 60 - Col 12,lines 65; Col 19, lines 45 - Col 20, lines 50).

As for claim 26, George, II et al shows a computer readable medium encoded with processing instructions (Fig 3; Col 5,lines 35 - Col 6,lines 30) for performing a method of allowing a mobile robot to return to a designated location (abstract; Col 1, lines 50 - 70), and the mobile robot automatically returns from a first location to the designated location, the method comprising: calculating a first direction angle of the mobile robot at a second location arrived at after the mobile robot travels a first distance from the first location (abstarct, Fig 5; Col 1,lines 45 - 65); determining whether the mobile robot approaches or moves away from the designated location (Fig 5, Fig 7, Fig 13, Col 6,lines 30 - Col 7,lines 15; Col 11,lines 60 - Col 12,lines 65; Col 13,lines 60 - Col 14, lines 55), at a third location arrived at after the mobile robot rotates by the first direction angle and then travels a second distance (Fig 5, Fig 7, Fig 9, Fig 10, Fig 13; Col 6,lines 30 - Col 7,lines 15; Col 9,lines 10- Col 11, lines 5; Col 11,lines 60 - Col 12,lines 65

); and if the result of the determination indicates that the mobile robot approaches the designated location (Fig 5, Fig 7, Fig 9, Fig 10, Fig 13; Col 6, lines 30 - Col 7, lines 15; Col 9,lines 10- Col 11, lines 5; Col 11,lines 60 - Col 12,lines 65), controlling the mobile robot to travel according to the first direction angle (Fig 5, Fig 7, Fig 9, Fig 10, Fig 13; Col 6, lines 30 - Col 7, lines 15; Col 9,lines 10- Col 11, lines 5; Col 11,lines 60 - Col 12,lines 65), and if the result indicates the mobile robot moves away from the designated location (Fig 5, Fig 7, Fig 13, Col 6,lines 30 - Col 7,lines 15; Col 11,lines 60 - Col 12,lines 65; Col 13,lines 60 - Col 14,lines 55), calculating a second direction angle of the mobile robot at the third location (Fig 5, Fig 7, Fig 13, Col 6,lines 30 - Col 7,lines 15; Col 11,lines 60 - Col 12,lines 65; Col 13,lines 60 - Col 14,lines 55), and controlling the mobile robot to travel according to the second direction angle (Fig 5, Fig 7, Fig 9, Fig 10, Fig 13; Col 6, lines 30 - Col 7, lines 15; Col 9,lines 10- Col 11, lines 5; Col 11,lines 60 - Col 12,lines 65; Fig 4, Col 5,lines 55 - Col 6,lines 30; abstract; Col 1, lines 50 - 70).

Kim shows the designated location has a sound wave transmitter and the mobile robot has a sound wave receptor (Fig 1, Col 10, lines 35 -65; Fig 4, Col 4,lines 20- Col 5,lines 13).

It would have been obvious for one of ordinary skill in the art to provide the ultrasonic signal transmitter, as taught by Kim, to George II et al, since the navigation apparatus equipped on the George II et al can be easily manipulated using the method provided by Kim using the ultrasonice songal of George II et al.

11. Claim 11,20 are rejected under 35 U.S.C. 103(a) as being unpatentable over George,II et al (US Pat No 4777416) in view of Kim (US Pat 630814) and further in view of Jacobs (US Pat No 6580246).

As for claim 11, George, II et al shows the travel distance provided by the encoder is compensated for an error caused by slipping on a ground (Col 9,lines 55 - Col 10, lines 40). Geoge, II et al does not show a Kalman filter. Jacobs shows Kalman filtering technique using the multiple location information (Fig 4; Col 9,lines 60 - Col 1,lines 5; Col 18, lines 25 - 40).

It would have been obvious for one of ordinary skill in the art to provide the Kalman filter optimal error compensate feedback system technique as taught by Jacobs , to George, II et al, since the navigational apparatus equipped on George, II et al can be advantageously manipulated using the Kalman filter of Jacobs.

As for claim 20, George, II et al shows a compensator which receives inputs of a linear velocity command and an angular velocity command provided by travel controller (Fig 8; Fig 12, Fig 13; Col 6,lines 30 - Col 7,lines 15; Col 9,lines 10- Col 11, lines 5; Col 11,lines 60 - Col 12,lines 65; Col 18, lines 20- Col 19, lines 20; Col 5,lines 35 - Col 6,lines 20), the travel distance and the travel direction information of the mobile robot provided by the encoder (Col 4, lines 50 - Col 5,lines 15; Fig 5, Fig 7, Fig 9, Fig 10, Fig 13; Col 6, lines 30 - Col 7, lines 15; Col 9,lines 10- Col 11, lines 5; Col 11,lines 60 - Col 12,lines 65), and distance information between the designated location and the mobile robot calculated by the distance calculator (Fig 5, Fig 7, Fig 9, Fig 10, Fig 13; Col 6,lines 30 - Col 7,lines 15; Col 9,lines 10- Col 11, lines 5; Col 11,lines 60 - Col 12,lines 65), compensates for an error between a travel distance measured by the encoder and the actual travel distance (Fig 5, Fig 7, Fig 9, Fig 10, Fig 13; Col 6,lines 30 - Col 7,lines 15; Col 9,lines 10- Col 11, lines 5; Col 11,lines 60 - Col 12,lines 65). George, II et al does not show a Kalman filter.

Jacobs shows using a Kalman filtering (Fig 4; Col 9,lines 60 - Col 1,lines 5; Col 18, lines 25 - 40).

It would have been obvious for one of ordinary skill in the art to provide the Kalman filter optimal error compensate feedback system technique as taught by Jacobs , to George, II et al, since the navigational apparatus equipped on George, II et al can be advantageously manipulated using the Kalman filter of Jacobs.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Bauer et al (US Pat No 6278917) shows robot docking and return method.

Bauer et al (US Pat No 5794166) shows robot docking and return method.

Evertee, Jr. et al (US Pat No 5111401) shows robot docking and return method.

Perdue (US Pat No 4679152) shows robot docking and return method.

Whitaker (US Pat No 4809936) shows robot docking and return method.

Han (US Pat No 5646494) shows robot docking and return method.

Howard et al (US Pat 6091345) shows robot docking and return method.

Song et al (US Pat Pub 2002/0153185) shows robot docking and return method.

Song et al (US Pat 6496754) shows robot course adjusting method.

Peterson et al (US Pat No 6586908) shows robot docking and return method.

Song et al (US Pat Pub 6748297) shows robot docking and return method.

Lee et al (US Pat No 7031805) shows robot docking and return method.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ian Jen whose telephone number is 571-270-3274. The examiner can normally be reached on Monday - Friday 9:00-6:00 (EST).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Khoi Tran can be reached on 571-272-6916. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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11/31/2007
Ian Jen

KHOI H. TRAN
SUPERVISORY PATENT EXAMINER